

Energy and Low Carbon Heat

LHEES Capacity Building Workshop QGIS demonstrations Fri 28th April 2023

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Welcome and Introduction

Aims of the LHEES capacity building workshop

- Understand the adaptability of methodologies to other GIS software
- Provide uniform steps from the Stage 4 methodologies between ArcGIS and QGIS so that they can be replicated
- Provide an opportunity for local authority Q&A / feedback





LHEES Capacity Building Workshop QGIS Demonstrations

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Summary of LHEES Stages and Considerations

- LHEES Considerations
- LHEES Structure and Stages



LHEES Considerations

Energy

and Low Carbon Heat

ZERO WASTE SCOTLAND

	No.	LHEES considerations	Description
	1	Off-gas grid buildings	Transitioning from heating oil and LPG in off-gas areas
Heat decarbonisation	2	On-gas grid buildings	On-gas grid heat decarbonisation
	3	Heat networks	Decarbonisation with heat networks
	4	Poor building energy efficiency	Poor building energy efficiency
Energy efficiency and other outcomes	5	Poor building energy efficiency as a driver for fuel poverty	Poor building energy efficiency as a driver for fuel poverty
	6	Mixed-tenure, mixed-use and historic buildings	Mixed-tenure, mixed-use buildings, listed buildings, and buildings in conservation areas













QGIS Introduction

- Why QGIS?
- Data Types
- Breakdown of QGIS approaches





QGIS - Introduction

- QGIS is a <u>free</u> and open-source cross-platform geographic information system (GIS) software that supports viewing, editing, printing, and analysis of geospatial data.
- Historically most local authorities have used ArcGIS for spatial analysis of data.
- However, some local authorities use QGIS.
- LHEES <u>Stage 4 methodologies</u> were generated for use with ArcGIS this presentation shows the equivalent steps using QGIS.
- Need for the methodologies to be streamlined so they can be followed using both software packages.









Vector Data

 Vector data is a geographic data type where data is stored as a collection of points, lines, or polygons along with attribute data.

Raster Data

• Raster data is a geographic data type where data is stored as a grid of regularly sized **pixels** along with attribute data.







QGIS - Introduction

The LHEES Stage 4 approaches utilising ArcMap have been categorized into 7 QGIS groups.

- 1. QGIS Set-Up
- 2. Importing of Layers
- 3. Attribute Table Related
- 4. Selection
- 5. Vector Processes
- 6. Raster Processes
- 7. Symbology

Steps will be walked through using various LHEES Priorities for the area of **Central St Andrews in Fife**.







How are we going to run the presentation

Slide Setup:

- Listing of where each task is applicable in each LHEES methodology.
- Undertake few Sections then QGIS walkthrough
- Five Demos between seven QGIS Sections

<u>W</u> •	<u>here is this applicable:</u> All Stage 4 Methodologies
₩ • • •	here is this applicable: Non-Domestic – (1, 2) Heat Networks – (1, 2) Off Gas Grid – (1) Energy Efficiency – (2) Mixed Tenure – N/A On Gas Grid – (1)





QGIS Set-Up

- Coordinate System
- Add a Basemap





QGIS – Set-Up

Set-Up Introduction:

- Steps for opening the QGIS workspace for Stage 4 analysis
- Includes workspace setup (e.g. basemaps, applying projections) allows uniformity in the GIS analysis and outputs







Where is this applicable:All Stage 4

Methodologies

Coordinate System:

- Open Workspace
- Navigate to "Project Properties CRS"
- Select "EPSG:27700 British National Grid"
- Coordinate System is presented in bottom righthand corner



Basemap:

- Various basemaps available for utilisation
- As per Stage 4 methodologies, select "ESRI Topo"

Installation of the "QuickMapServices" Plugin may be required to get range of basemaps available.





- Import Vector Files
- Import Raster Files
- Import a CSV Files
- Create Geodatabase
- Save Files in a Geodatabase





Importing of Layers Introduction:

- Steps for inputting different data types into a QGIS workspace
- Saving layers within a single, central database for each Stage 4 Methodology.
- Geopackages improve organization of multiple layers and distribution of files.





Where is this applicable: All Stage 4 Methodologies

Import Vector and Raster Files:

- Navigate to Layer -> Add Layer
- Select either Add Vector or Raster Layer
- Click "..." to select File and OK to import into workspace
- Imported Files are shown in Layer Window
- Slightly different for .csv files



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Vector	File Protocoj: HTTP(S), cloud, etc.	
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Where is this applicable:All Stage 4

Methodologies

Import CSV Files:

- Navigate to Layer -> Add Layer
- Select "Delimited Text Layer"
- Click "..." to select File
- Ensure to:
 - File Format = "CSV"
 - Geometry Definition = "Point Coordinates"
 - The X and Y Fields correspond to those in the CSV
- Attribute Table Visualised
- Add Dataset

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Where is this applicable: All Stage 4 • Methodologies

Geodatabase:

- Creation of ESRI File Geodatabase is *unique* for ArcMap software
- Recommended use of **Geopackages** (.gpkg) to store datasets
- Undertaken once a layer has been imported / created
- Ensure to also save the QGIS Workspace, (.qgz file) •





	🔇 New GeoPa				
Database name	Database Table name Geometry type	C:\Users\baldous\Desktop\QGIS Demonstration.gpkg Background Mapping			
Layer Type		Include Z dimension Include M values			
Set Coordinate System	New Field Name Type Maximum len	Project CRS: EPSG:27700 - OSGB36 / British National Grid			
	Fields List	Type Length			
🗕 Database		Remove Field			
Layers within Database	Advanced O	ptions OK Cancel Help			
		Scottish Government Riaghaltas na h-Alba gov.scot			



Where is this applicable: All Stage 4 • Methodologies

Save Files to a Database:

- Right Click a File -> Export -> Save As
 - Ensure as a **GeoPackage**
 - Saving within the Database
- Files can also be dragged from the Layers Panel into the Database dropdown of the Browser Panel
- **Temporary layers** (Symbolised by) are generated after some processes, are required to be saved, else will be lost after QGIS is closed.

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Add Layer Notes		Save as Layer Definition File
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- Copy Attribute Table to Excel
- Creation of Fields
- Field Calculator Calculation (e.g. LHD)
- Set Max Values (e.g. 250m)
- Delete values from attribute table





Attribute Table Related Introduction:

- Visualizing displayed information on features of a selected vector layer.
- Creating new Fields and perform calculations on attributes.
- Deleting unused fields / columns.





Where is this applicable:

- Non-Domestic -(1, 2)٠
- Heat Networks -(1, 2)
- Off Gas Grid -(1)
- Energy Efficiency -(2)
- Mixed Tenure N/A
- On Gas Grid -(1)

Copy Attribute Table to Excel (1):

- Open Attribute Table (📰)
 - Right Click Layer -> Open Attribute Table
- Select All (CTRL + A)
- **Copy** (CTRL + C)
- Open Excel
- **Paste** (CTRL + V)

Creation of Fields (2):

- **Open Attribute Table**
- Enable Lay<u>er E</u>diting (//)

= + - / * ^ || () '\n'

- Add Field [🔚 🏗) — this won't populate the field just create one
- OR

Ou Ou Ou

From the Field Calculator (🔛) -

field if an expres	ssion or valu	ie is ente	ered
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Create virtual field			
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		Length 10 OK	Cancel





Field Calculator Calculations:

- Open Attribute Table
- Click Field Calculator (🔛)
- 1. Unique Zone IDs
 - Utilises '@row_number'
 - Ensure Field Type is as Text
 - Concat function combines text from multiple strings
 - Text within an expression is between single quotation marks ' '
- 2. Calculate Area (m²)
 - '\$area' from "Geometry" Dropdown
- 3. Field Value Calculations (e.g. LHD)
 - Select Fields from "Fields and Values" Dropdown
 - E.g. "Annual kWh"
 - Combine Fields with calculation
 - Fields within an expression once selected are between double quotation marks ""

Output field nam	ne Zone ID	
Output field type	e Text (string)	•
Output field leng	th 10 🗣 Precision 3	-
Expression	Function Editor	
concat <mark>(</mark> 'A	ADD Text',@row_number)	



- Non-Domestic (3)
- Heat Networks (1, 2, 3)
- Off Gas Grid N/A
- Energy Efficiency (3)
- Mixed Tenure N/A
- On Gas Grid N/A

Function Editor Expression Q Search.. n R Show Help \$area row numbe Aggregates Arrays iles and Path Fuzzy Matching Genera Expression Function Editor angle_at_vertex \$area area 💼 🕹 🗘 azimuth boundary bounds "Annual kWh" /4000 bounds height





Where is this applicable:

- Non-Domestic N/A
- Heat Networks (1, 2)
- Off Gas Grid N/A
- Energy Efficiency N/A
- Mixed Tenure N/A
- On Gas Grid N/A

Field Calculator Calculations Continued:

- Open Attribute Table
- Click Field Calculator (i)
- 1. Set Max Values
 - Select Values of which to overwrite (e.g. Select by Attributes)
 - Open Field Calculator
 - Ensure to click update selected features only
 - Click Update existing field and select the field from the dropdown
 - Enter in expression box value to overwrite with
- 2. Delete rows from Attribute Table
 - Select Rows / Values to delete
 - Enable Layer Editing (//)
 - Delete Selected Features (<a>fm

✓ Only update 23 selected features	
Create a new field	✓ Update existing field
Create virtual field Output field name Output field type Whole number (integer) Output field length 10 Precision 3	123 LHD 👻
Expression Function Editor	earch Show Help
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QGIS Selection Methods

- Select by Attributes
- Visual Select Tool
- Clear Selection
- Creation, Deletion and Moving Points





QGIS – Selection Methods

Selection Methods Introduction:

- Selecting by attributes (process in the attribute table)
- Selecting by location
- Adding and moving points particularly useful after internal review





QGIS – Selection Methods

Where is this applicable:

 All Stage 4 Methodologies

- 1. Select by Attributes / Expression
- Open Attribute Table of Layer
- Click Select Features Using An Expression (5)
- Insert Expression for Selection
 - Using the 'Fields and Values' dropdown to select the Field
- These can then be exported as new layer if required
 - Right Click Layer -> Export -> Save Selected Features As
- 2. Clear Selection Button
- Once a Selection has been made, ensure to clear the selection
- So doesn't affect future processes
- 3. Visual Selection
- Click / Select layer in Layer Panel
- Click Select Features by Area (
 - Click and Drag to Select an Area
 - Single Click to Select a Point
 - Hold Shift or CTRL to Select more than one Point









Where is this applicable:

 All Stage 4 Methodologies

- 1. Adding, Deleting and Moving Point Data
- Click / Select layer in Layer Panel
- Enable Layer Editing (🖉)
- Add a Point Click Add Point Feature (***)
 - Click location, set values and OK
- Delete a Point Select Point
 - Click Delete or Delete Selected Features (
- Move a Point Click Vertex Tool (1/2008)
 - Click on Point, Click for new Location
- Ensure to click Enable Layer Editing again to Save Changes





QGIS Vector Processes

- Buffer Tool
- Dissolve Tool
- Clip Tool
- Spatial Join Tool
- Polygon Attributes to Point Data
- Merging of Shapefiles





Vector Processes Introduction:

- Use various vector tools to perform spatial operations this includes tools from different QGIS toolboxes
- How to carry out the analysis on appropriate vector layers predominately point data but also polygon datasets





QGIS – Vector Processes

- 1. Buffer Tool
- Define areas at specified distances from an object
- Either a set distance e.g. 10 meters
- Or set by a Field Variable e.g. LHD Field
- May automatically Dissolve
- 2. Dissolve Tool
- Combining adjacent polygons, spatially or by a specified attribute
- Input Layer and Run if Spatially Dissolving
- Select "Dissolve Field" if Dissolving by Field Attribute

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- Non-Domestic N/A
- Heat Networks (1, 2)
- Off Gas Grid (2)
- Energy Efficiency (2)
- Mixed Tenure (2)
- On Gas Grid (2)

🔇 Buffer						
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QGIS – Vector Processes

- 1. Clip Tool
- Input Layer the user would like to clip e.g. Point Data
- Select Overlay which is the boundary to clip by, e.g. Certain IZ.
- 2. Merge Shapefiles
- Used when merging different LHD clusters together into one Shapefile
- Select Merge Vector Layers
- Select the layers to merge and the coordinate system

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- Non-Domestic N/A
- Heat Networks (2)
- Off Gas Grid (1)
- Energy Efficiency N/A
- Mixed Tenure (1)
- On Gas Grid (1)







QGIS – Vector Processes

- 1. Spatial Join Tool
- To calculate Sum, Count and Averages
- Use "Join Attributes by Location (Summary)" Tool
 - Polygon is Input, Point data is Join Layer
 - Geometric predicate leave as Intersect
 - Choose the field you want to summarise
 - Choose mean, and/or any other stats to calculate

2. Polygon Attributes to Point Data

- Use "Join Attributes by Location (Summary)" Tool
 - Point Data is Input, Polygon is Join Layer
 - Geometric predicate leave as Intersect
 - Choose the field you want to Join

- Non-Domestic (1, 2)
- Heat Networks (1, 2)
- Off Gas Grid (1)
- Energy Efficiency N/A
- Mixed Tenure N/A
- On Gas Grid (1)

🔇 Join Attributes by Location (Summary)
Parameters Log
Input layer
- 🗘 🔧 🗆
Selected features only
Join layer
- 🗘 🔧 🗆
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Geometric predicate
✓ intersects overlaps
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equals crosses
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Fields to summarise (leave empty to use all fields) [optional]
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0 options selected





- Raster to Polygon Tool
- Raster Calculator
- Raster Extract by Attributes
- Integer Tool
- Point to Raster Tool
- Inverse Distance Weighting Tool
- Raster Weighted Sum Tool
- Standard Deviation







Raster Processes Introduction:

- Converting to and from vector to raster
- Extracting raster values
- Carrying out analysis in the raster Field Calculator





Integer Tool:

- Rounding of Rasters to a whole number integer
- Raster -> Conversion -> Translate (Convert Format)
- Input Raster and select Coordinate System
- Click Advanced Parameters Dropdown
- Select "Int32"
- Int32 is chosen over Int16 due to holding larger numerical values

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- Non-Domestic N/A
- Heat Networks Yes
- Off Gas Grid Yes
- Energy Efficiency Yes
- Mixed Tenure Yes
- On Gas Grid Yes

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1. Raster Calculator

- Search for Tool within Processing Toolbox
- Very similar tool presentation between ArcMap and QGIS
- Ensure to change Cell Size and CRS
- 2. Raster Extract by Attributes
- No stand-alone tool
- Uses Raster Calculator
- In Expression box insert Layer and use = and/or < , > values to Select, e.g. areas over 50 kWh/yr/m2
- Creates areas with 1 or 0
- Convert to Polygon
- **Delete** areas = 0
- Alternatively for presentation purposes 0 values can be set to transparent for visual purposes

Processing Help	
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(<u>H</u> istory	Ctrl+Alt+H
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Edit Features In-Place	

- Non-Domestic N/A
- Heat Networks (1, 2)
- Off Gas Grid (2)
- Energy Efficiency (1)
- Mixed Tenure (2)
- On Gas Grid (2)

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- 1. Raster to Polygon Tool
- Use Polygonize Tool
- Input Raster and Band (Field)

2. Point to Raster Tool

- No stand-alone tool to calculate Sum, Count and Average when converting to Raster
- **Create a Grid** set as Rectangle, Grid extent to be that of the Point Dataset and create spacing e.g. 100m by 100m.
- Use "Join Attributes by Location (Summary)" Tool
 - Grid is Input, Point data is Join Layer
 - Geometric predicate leave as Intersect
 - Choose the field you want to summarise
 - Choose mean, and/or any other stats to calculate
- Delete any squares with no data
- Use Rasterize Tool



Q Join Attributes b	y Location (Summary)
Parameters Log	3
Input layer	
	- CJ 🔧 🖃
Selected features	only
Join layer	
	- (,)
	
Selected features	only
Geometric predicate	
✓ intersects	overlaps
contains	within
equals (crosses
touches	
Fields to summarise (leave empty to use all fields) [optional]
0 options selected	
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102 - STATE - 1445	Polygonize (Raster to Vector)
	Basterize (Vector to Baster)
OBURN	
	Translate (Convert Format)

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Where is this applicable:

- Non-Domestic N/A
- Heat Networks (N/A)
- Off Gas Grid (1, 2)
- Energy Efficiency (1)
- Mixed Tenure (1, 2)
- On Gas Grid (1, 2)

Parameters Log		
Grid type		
Rectangle (Polygon)		
Grid extent		
Horizontal spacing		
1.000000	÷	meters
Vertical spacing		
1.000000	÷	meters
Horizontal overlay		
0.000000	* *	meters
Vertical overlay		
0.000000	* *	meters
Grid CR5		
EP5G:27700 - O5GB36	/ British National	Grid 💌 🍕
Grid		
Create temporary lave	-1	

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- 1. Inverse Distance Weighting (IDW)
- Search for "IDW Interpolation" Tool within Processing Toolbox
- Select Layer and Field / Attribute, click Add (green plus)
- Set coefficient to **2.5**, pixel size to **100m** and extent
- 2. Raster Weighted Sum Tool
- Not stand-alone tool
- Uses Raster Calculator
- For Layer 1 (60% weighting), Layer 2 30%, Layer 3 10%:
- In Expression Box
 - 0.6*Layer 1 + 0.3*Layer 2 + 0.1*Layer 3
- Set Cellsize, extent and CRS and Click Run
- 3. Raster Standard Deviation
- Search for "Raster Layer Statistics" within Processing Toolbox
- Input Layer and Run
- Click Results Viewer to view Statistics such as Range, Mean, Standard Deviation of Raster Dataset.

Q IDW Interpolation			×			
Parameters Lon			L			
Input layer(s)						
Vector layer						
Interpolation attribute	123 id		-			
Use Z-coordinate fo	or interpolation					
Vector layer	Attribute	Туре				
Distance coefficient P 2.000000 Extent)		•			
Output raster size						
Rows 1	Columns	1				
Pixel size X 1.00.000000	D Pixel size Y	100.000000				
Interpolated [Save to temporary file] Open output file after running algorithm						
0% Cancel						
Run as Batch Process	Run	Close	Help			

- Non-Domestic N/A
- Heat Networks N/A
- Off Gas Grid (3)
- Energy Efficiency (1, 2)
- Mixed Tenure (3)
- On Gas Grid (3)





QGIS Symbology Related

- Different Types of Symbology
 - Graduated Colour
 - Colour by Category
- Symbology Classifications
- No. Classes and Range Values
- Sized Points
 - Colour and Size Combines
- Shape of Points
- Layer Transparency





QGIS – Symbology Related

Where is this applicable: All Stage 4 • Methodologies

To Open the Symbology Window of a Layer: Right Click Layer -> Properties -> Symbology

Four primary Symbology types:

- Vector Single Symbol
- Vector Categorized
- Vector Graduated
- Raster Singleband Pseudocolor _











QGIS – Symbology Related

Where is this applicable:
All Stage 4 Methodologies

Single Symbol:

- 1. Point Data Size
- Point Size presented.
- 2. Point Data Shape
- Click "Simple Marker", Select Shape at bottom
- 3. Point Data Sized by Value
- Click (
 next to Size, Field Type and Select Field to size by e.g. Heat Demand.
- 4. Layer Colour
- Click "Simple Marker" and edit "Fill Color", "Stroke Color", "Stroke Style" and "Stroke Width".
- 5. Layer **Transparency**
- Opacity bar presented
- Or click "Layer Rendering"







QGIS – Symbology Related

Categorised: - Unique Value Symbology

Select "Value" Field from dropdown list and click "Classify"

- 1. Point Data Size
- Click "Symbol" under "Value" to change ALL symbols.
- Click Symbols under Symbol Column to change manually
- 2. Point Data Shape
- Same as for Data Size
- 3. Colour by Category and Size combined
- Click "Symbol" under "Value"
- Click () next to Size, -> Assistant
- Select Source / Field and Refresh (2)
- 4. Layer Colour
- Select Color Ramp from dropdown or "Random Colour"
- And/or Same as for Data Size
- 5. Layer Transparency
- Click "Layer Rendering", change Opacity



Where is this applicable:
All Stage 4 Methodologies



QGIS – Symbology Related

Graduated: - Used to show **numerical quantitative differences** Select "Value" Field from dropdown list and click "Classify"

- 1. Point Data Size and Shape
- Click "Symbol" under "Value" to change ALL symbols.
- Click Symbols under Symbol Column to change manually
- Change Method present changes in **colour or size** of symbols
- 2. Layer **Colour**
- Select Color Ramp from dropdown
- Click Symbols under Symbol Column to change individually
- 3. Colour by Category and Size combined
- Same as for "Categorised"
- 4. Change no. Classes and Range Values
- Edit No. Classes
- Double Click Values in "Value Column" to edit band values.
- 5. Layer Transparency
- Click "Layer Rendering", change Opacity

Where is this applicable:
All Stage 4 Methodologies

📕 Graduate	d		•
Value	1.2 Emission		3 -
Symbol			•
Legend format	%1 - %2		zision ℓ 🐼 🗘 Trim
Method	Color		•
Color ramp			
Classes H	listogram		
Symbol	▼ Values	Legend	
V()	0.000000000 - 0.0000001581	0 - 0.00000016	
v 🗎	0.0000001581 - 0.0000070262	0.00000016 - 0.00000703	
v 🗎	0.0000070262 - 0.0053982184	0.00000703 - 0.00539822	
v 📕	0.0053982184 - 0.1330243626	0.00539822 - 0.13302436	
v 👅	0.1330243626 - 9104.6528400000	0.13302436 - 9104.65284	
Mode 🚺 Eq	uual Count (Quantile) 🔻		Classes 5
Classify	Delete All		Advanced *
✔ Link class b	oundaries		
Layer Ren	dering		
C 1		OK Casal	Apply Holp





QGIS – Symbology Related

Raster – Singleband Pseudocolor:

- 1. Layer Colour
- Select a "Color Ramp" from dropdown menu.
- Manually click Colour within "Color Column" to change.
- 2. Change no. Classes and Range Values
- Change Mode to "Equal Interval"
- May now edit No. Classes from default locked 5
- Double Click Values in "Value Column" to edit band values.
- 3. Layer Transparency
- Click "Transprency" in Layer Properties
- Edit "Global Opacity"

Multiband color			
Paletted/Unique values			
Singleband gray			
Singleband pseudocolc			
Hillshade			
Contours			

- Non-Domestic N/A
- Heat Networks (1, 2, 3)
- Off Gas Grid (1, 2, 3)
- Energy Efficiency (1, 2, 3)
- Mixed Tenure (1, 2, 3)
- On Gas Grid (1, 2, 3)

Band Rendering			
Render type Singleband pseud	ocolor 🔻		
Band	Band 1 (Gray)	 Q Layer Prop 	perties
Min	673.2141354999999976 Max	498000000	
Min / Max Value Settings			
Interpolation	Linear	Informati	on
Color ramp		Source	
Label unit suffix			
Label precision	4		gy
Value Cok	or Label	Transpare	ency
673.2141354999	673.2141	Histogram	m
114500504	114500504.0000	·	
249000336.6070	249000336.6071	Kendering 🗸	g
		🕓 Temporal	1
373500168.3035	373500168.3035	- Duramids	
498000000	498000000.0000		
		🥑 Metadata	a
Mode Equal Interval 💌		Classes 5 🖾 <table-cell-rows></table-cell-rows>	
Classify 🕞	= 🗳 🛅 🛃	Legend Settings	
Clip out of range values		QGIS Serv	ver





ArcMap Task and QGIS counterpart

- Table lists all ArcMap tasks referred to within LHEES Methodology
- Each is categorized and the equivalent QGIS function given.
- Task symbol in QGIS shown.
- Notes with short process overview provided.





GIS Task Database (1)

Each "ArcMap Task" is listed with the "Category" within this PowerPoint, the "QGIS Counterpart" name if different, a "Symbol" for the Task and brief notes on undertaking

No.	ArcMap Task	Category	QGIS Counterpart	Task Symbol	Notes
1	Coordinate System	Set Up	Same	@ EPSG:27700	Project -> Properties -> CRS
2	Basemap	Set Up	Same	ESRI Topo	Web -> QuickMapServices -> ESRI -> ESRI Topo
3	Import Vector File	Importing Layers	Same	$\bigvee_{\mathbf{D}}^{*}$ Add Vector Layer	Layer -> Add Layer -> Add Vector Layer
4	Import Raster File	Importing Layers	Same	Radd Raster Layer	Layer -> Add Layer -> Add Raster Layer
5	Import CSV File	Importing Layers	Same	? Add Delimited Text Layer	Layer -> Add Layer -> Add Delimited Text Layer Click CSV -> Point Coordinates -> Set X and Y
6	ArcMap Geodatabase	Importing Layers	GeoPackage	💎 GeoPackage	Once layer in workspace. Save as Geopackage. Set GeoPackage Database name and Layer Name
7	Save to Database	Importing Layers	GeoPackage	😵 GeoPackage	Drag into GeoPackage OR Save as Geopackage, same Database, set Layer Name
8	Copy to Excel	Attribute Table	CSV File	E <u>x</u> port	Export -> Save As -> Comma Separated Value (CSV)
9	Editing	Attribute Table	Editing Mode	/	In QGIS Digitizing Toolbar OR Within Attribute Table (AT) -> Enable Editing
10	Add Field	Attribute Table	New Field		Open AT -> Enable Editing -> New Field





GIS Task Database (2)

No.	ArcMap Task	Category	QGIS Counterpart	Task Symbol	Notes
11	Field Calculator	Attribute Table	Same	100	Open AT -> Field Calculator
12	Delete Selected	Attribute Table	Same	Ū	Open AT -> Enable Editing -> New Field
13	Select by Attributes	Selection Method	Select by Expression	<mark>8</mark>	Open AT -> Click -> Create Expression
14	Clear Selection	Selection Method	Deselect Features		In QGIS Selection Toolbar OR Within AT
15	Select Features	Selection Method	Same	R.	In QGIS Selection Toolbar
16	Create Features	Selection Method	Add Point Feature	°°	Enable Editing -> In QGIS Digitizing Toolbar
17	Edit Vertices	Selection Method	Vertex Tool	Ĩ <u>₹</u>	Enable Editing -> In QGIS Digitizing Toolbar
18	Delete Feature	Selection Method	Delete Selected	1	Enable Editing -> Select Feature -> Click or DELETE
19	Buffer	Vector Processes	Same	P Buffer	Vector -> Geoprocessing -> Buffer
20	Dissolve	Vector Processes	Same	Dissolve	Vector -> Geoprocessing -> Dissolve
21	Clip	Vector Processes	Same	🛒 Clip	Vector -> Geoprocessing -> Clip
22	Merge	Vector Processes	Merge Vector Layers	P Merge Vector Layers	Vector -> Data Management -> Merge Vector Layers



GIS Task Database (3)

Energy

and Low Carbon Heat

ZERO WASTE SCOTLAND

No.	ArcMap Task	Category	QGIS Counterpart	Task Symbol	Notes
23	Spatial Join	Vector Processes	Join Attributes by Location (Summary)	* <u>T</u> oolbox	Search for tool within Processing Toolbox (Processing -> Toolbox)
24	Int (Spatial Analyst)	Raster Processes	Translate (Convert Format)	🖁 Translate (Convert Format)	Raster -> Conversion -> Translate (Convert Format)
25	Raster Calculator	Raster Processes	Same	* <u>T</u> oolbox	Search for tool within Processing Toolbox
26	Extract by Attributes	Raster Processes	Raster Calculator	* <u>T</u> oolbox	Search for tool within Processing Toolbox (Processing -> Toolbox) -> Convert to Polygon & Delete unsuitable values or alter Symbology
27	Raster to Polygon	Raster Processes	Polygonize	Polygonize (Raster to Vector)	Raster -> Conversion -> Polygonize
28	Point to Raster	Raster Processes	Rasterize	🍗 Rasterize (Vector to Raster)	Raster -> Conversion -> Rasterize To Get Statistics also -> Create Grid -> Join Attributes by Location -> Rasterize
29	Inverse Distance Weighting (IDW)	Raster Processes	IDW Interpolation	* Toolbox	Search for tool within Processing Toolbox
30	Weighted Sum	Raster Processes	Raster Calculator	* <u>T</u> oolbox	Search for tool within Processing Toolbox
31	Standard Deviation	Raster Processes	Raster Layer Statistics	* <u>T</u> oolbox	Search for tool within Processing Toolbox (Processing -> Toolbox)



GIS Task Database (4)

Energy

and Low Carbon Heat

ZERO WASTE SCOTLAND

No.	ArcMap Task	Category	QGIS Counterpart	Task Symbol	Notes
32	Single Symbol	Symbology	Same	Single Symbol	Right Click -> Symbology -> Single Symbol Set Size Size by Value -> Click 'Data Defined Overide' (, -> Field Type -> Select Field Simple Marker -> Set Shape, Fill and Stroke Colours Layer Rendering -> Transparency
33	Categories	Symbology	Categorized	E Categorized	Right Click -> Symbology -> Categorized Click Main Symbol -> Set Size and Shape Click Individual Symbols -> Set Colours Size by Value -> Click Main Symbol -> 'Data Defined Overide' 🖶 -> Assistant -> Select Field Layer Rendering -> Transparency
34	Quantities	Symbology	Graduated	<mark>문</mark> Graduated	Right Click -> Symbology -> Graduated Click Main Symbol -> Set Size and Shape Set Colour ramp Set no. Classes and Range Values Layer Rendering -> Transparency
35	Raster Classified	Symbology	Singleband Pseudocolor	Singleband pseudocolor	Right Click -> Symbology -> Singleband Pseudocolor Set Colour ramp Set no. Classes and Range Values Layer Properties -> Transparency

